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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/049,188	02/08/2002	Tomoaki Yoshida	Q63028	8127

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EXAMINER	
CANTELMO, GREGG	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 04/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/049,188	YOSHIDA ET AL.	
	Examiner	Art Unit	
	Gregg Cantelmo	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6, 9-12, 14- 24 and 26-30* is/are pending in the application.

4a) Of the above claim(s) *2-6,9-12,14-16 and 28* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 17-24, 26, 27 and 29-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the amendment received March 30, 2006:

a. Claims 1-6, 9-12, 14- 24 and 26-30 are pending. Claims 7, 8, 13 and 25 have been cancelled as per Applicant's request. Claims 2-6, 9-12, 14-16 and 28 have been withdrawn from consideration (non-elected claims from the previous restriction). Action on the merits of claims 1, 17-24, 26, 27 and 29-30 is provided herein;

b. The issue regarding the claim to priority is withdrawn;

c. The rejections of EP '637 in view of JP '571, Nishimura and Fischer stand.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 17, 18, 21-24, 26, 27, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 184638-A2 (EP '638) in view of JP 62-287571-A (JP '571) and U.S. patent No. 6,489,026 (Nishimura) and either U.S. Patent No. 6,013,311 (Hager), U.S. Patent Application Publication No. 2002/0051903 (Masuko) or U.S. Patent No. 6,447,950 (Iijima).

EP '638 discloses a fuel cell and membrane electrode assembly (MEA) wherein the MEA comprises an electrolyte membrane 11, an electrode 3 or 8 including a catalyst

layer 5 or 10, respectively, and gas diffusion layer 4 or 9, respectively, with the electrodes being provide on each surface of the electrolyte membrane 11 wherein at least a portion of the gas diffusion layers 4 and 9 are in contact with the catalyst layers 5 and 10, respectively and include a hydrophobic resin (polytetrafluoroethylene) and carbon fibers (Fig. 1 and abstract as applied to claims 1, 17, 21 and 29). Separators 1 and 6 sandwich the MEA (Fig. 1 as applied to claim 29).

The catalyst layer, including the boundary between the catalyst layer and gas diffusion layer includes conductive particles such as carbon black which is applied to the electrodes in the form of a paste. Since the gas diffusion electrode is porous, at least a portion of the catalyst paste will penetrate the boundary between the gas diffusion layers and catalyst paste layers (paragraph bridging pages 13 and 14, page 28 and page 29 as applied to claims 18 and 21).

The resin is polytetrafluoroethylene (abstract as applied to claim 27).

The arrangement is provided in a fuel cell stack and thus comprises layering at least 2 cells together (page 1 and paragraph bridging pages 16 and 17 of EP '638 as applied to claim 30).

The differences between claims 1, 17, 21-24, 26 and 29 and EP '638 are that EP '638 does not disclose of the carbon fiber being a graphitized vapor grown carbon fiber (VGCF) having a fiber filament of 10-300 nm (claims 1, 17, 21, 22 and 29); of forming the fiber through heat treatment at a temperature of at least 2000°C (claim 23), of the fiber containing boron in an amount from 0.01-10mass% (claim 24), of the fiber having a filament length of less than 100 microns (claim 26).

With respect to the vapor grown carbon fiber having a fiber filament of 10-300 nm (claims 1, 17, 21, 22 and 29):

JP '571 discloses a gas diffusion electrode in a fuel cell wherein the electrode comprises PTFE and vapor grown carbon fibers having a fiber filament of 200-500 Angstroms, or 20-50 nm (abstract and underscored text on page 323 of JP '571 as applied to claims 1, 17, 21, 22 and 29). Nishimura discloses vapor grown carbon fibers in a electrodes wherein the fibers are dimensioned from 0.01-1 micron (col. 5, ll. 53-56), preferably 0.5 microns or les (col. 6, ll. 5-6 as applied to claims 1,17, 21, 22 and 29).

The motivation for using the gas diffusion layer of JP '571 is that it improves the gas permeability and electrical conductivity of the gas diffusion layer.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '638 by using the gas diffusion layer as taught by JP '571 since it would have improved the gas permeability and electrical conductivity of the gas diffusion layer.

With respect to the % mass of the carbon fiber (claim 22):

Nishimura discloses vapor grown carbon fibers used in electrodes wherein the fibers are present in the electrode in an amount up to 20 mass % (col. 11, ll. 48-54).

The motivation for providing up to 20 mass % of the vapor grown carbon in the electrode layer is that it optimizes the charge-discharge capacity of the battery produced.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '638 by providing up to

20 mass % of the vapor grown carbon in the electrode layer since it would have optimized the charge-discharge capacity of the battery produced.

With respect to the temperature of forming graphitized VGCF (claims 1, 17, 21, 22, 23, 28 and 29):

Nishimura discloses heating the carbon to temperatures of at least 2000°C (abstract).

The motivation for heating the carbon to temperatures of at least 2000°C is that it enhances the crystallinity of the carbon (col. 2, ll. 15-25 and col. 3, ll. 1-9).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '638 by heating the carbon to temperatures of at least 2000°C since it would have enhanced the crystallinity of the carbon.

With respect to the fibers containing boron in an amount of 0.01-10 mass% (claim 24):

Nishimura discloses that a boron additive is provided during the heat crystallization of the vapor grown carbon fibers as a catalytic material (col. 7, ll. 58-61) with the end carbon product having 0.1 to 10 mass% boron therein (col. 4, ll. 34-38).

The motivation for providing boron in the amount taught by Nishimura and recited in the instant claim is that it provides a catalytic material which enhances the crystallization of the carbon fibers.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '638 by providing boron

in the amount taught by Nishimura and recited since it would have provided a catalytic material which enhances the crystallization of the carbon fibers.

With respect to the length of the fibers (claim 26):

Nishimura discloses that the fiber length is preferably no more than 100 microns. And by example when the fiber diameter is 0.01 microns (10 nm) the fiber length is 0.5 microns (col. 6, ll. 13-19).

The motivation for controlling the aspect ratio is that it provides a fiber which has sufficient length to provide good mechanical strength and electrical conductivity along the fibers while providing good dispersability of the fibers in the electrode.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '638 by controlling the aspect ratio since it would have provided a fiber which has sufficient length to provide good mechanical strength and electrical conductivity along the fibers while having also provided good dispersability of the fibers in the electrode.

With respect to the addition of Nishimura to fuel cell electrodes:

Hager discloses using VGCF in either lithium batteries or fuel cells (col. 12, ll. 11-16). Masuko discloses VGCF being useful in both lithium secondary battery electrodes and fuel cell electrodes (para.[0004]). Iijima discloses VGCF being useful in both lithium secondary battery electrodes and fuel cell electrodes (col. 7, ll. 41-48).

Therefore the art establishes of the applicability of VGCF to both lithium electrodes and fuel cell electrodes.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '638 in view of the teachings of Nishimura, since the art establishes that a teaching to VGCF for a lithium electrode and alternatively be employed in fuel cell electrodes.

3. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP '638 in view of JP '571, Nishimura and either Hager, Masuko or Iijima as applied to claims 17 and 18 above, and further in view of U.S. patent No. 5,861,222 (Fischer).

The difference not yet discussed is of the spaces arrangements of claims 19-20.

Fischer discloses of a gas diffusion layer comprising a bimodal pore distribution and wherein the total porosity of more than 40% to less than 75% is composed of small pores with an average diameter of up to 0.5 microns and large pores with an average diameter of 1 to 20 microns.

The motivation for providing the porosity of Fischer to the gas diffusion layer of EP '638 is that it enhances the diffusive characteristics of the gas diffusion layer while maintaining adequate mechanical strength to the layer.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '638 by providing the porosity of Fischer to the gas diffusion layer of EP '638 since it would have enhanced the diffusive characteristics of the gas diffusion layer while maintained adequate mechanical strength to the layer.

Response to Arguments

4. Applicant provides no arguments to this rejection in their response filed March 20, 2006. In response to the previous arguments presented March 21, 2005 applicant argues that Nishimura does not teach or suggest employing the process therein for forming graphitized VGCF in a fuel cell electrode.

The examiner is not persuaded.

As set forth above, the combination of EP '638 and JP '571 teach that the use of VGCF in fuel cell electrodes is known for the purpose of imparting electrical conductivity to the gas diffusion electrode in a fuel cell. Thus the concept of incorporating VGCF would have been known to one of ordinary skill in the art.

Nishimura teaches of a graphitization process for VGCF which, by enhancing the crystallinity of the VGCF (i.e., increasing the degree of graphitization of the VGCF), the conductivity of the VGCF is vastly improved.

Newly cited Hager, Masuko and Iijima establish that teachings of VGCF materials in electrodes of lithium batteries can also be employed in gas diffusion electrodes of fuel cells. Thus while Nishimura itself does not suggest alternative use of the VGCF in fuel cells, one of ordinary skill in the art would have had known that such materials can be alternatively employed in fuel cell electrodes, as shown by either Hager, Masuko or Iijima with reasonable expectation of success.

Thus the combination of EP '638 in view of both JP '571, Nishimura and either Hager, Masuko or Iijima are held to reasonably suggest the claimed invention as set forth above.

Conclusion

2. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is 571-272-1283. The examiner can normally be reached on Monday to Thursday, 8:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Gregg Cantelmo
Primary Examiner
Art Unit 1745

gc

April 21, 2006